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AUTHOR Colton, Frank V.
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ABSTRACT

This description of the model used to teach instructional development to teachers at the University of Kentucky includes strategies and approaches used in the course; exercises, projects, and activities used in the class; and copies of forms and handouts used by the class. Alternative teaching materials, primarily textbooks, are also described. The history of the course is presented within the context of the history of instructional development. The text is supplemented with various tables and figures, and an 84-item bibliography, which includes basic textbooks, is provided. (Author/EW)

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CHAPTER III

STRATEGIES FOR TEACHING AND LEARNING INSTRUCTIONAL DESIGN

By Frank V. Colton

Nearly a decade ago, at Wayne State University, while taking one of my first courses in instructional technology, Dr. John Gordon introduced me to a basic model for planning instruction. Inasmuch as I had never given much thought to the design of instruction, I was at first skeptical about the necessity to perform many functions while attempting to teach something as simple as tying a bow. (See Figure 1) However, the simple logic associated with each of the steps and the subsequent proof of their worth in working with youngsters (in our classes to teach uncomplicated tasks) soon gave me all the evidence I needed. I have a feeling that Gordon's model and many of his informal papers which he generously shared with his students would have been quite valuable to the public, yet he did not publish them.

Figure 1. A Basic Model for Planning Instruction*

1. INTRODUCE THE TASK—It is important to tell learners *what* they are going to be doing. (Sometimes it even helps the teacher to think about exactly what is going to happen!)
2. PUT THE TASK INTO CONTEXT—Sometimes we forget to capitalize on reminding learners about what they have learned before and what they will soon be learning. This is also important to a teacher in making early decisions about prerequisites and sequences.
3. SECURE A COMMITMENT—Lessons should be made appealing enough to learners so that they are ready and willing to say, "Let's go!"
4. POST TEST—Does this step seem out of place? Not really. How many times do we teach things to students which they *already know?* (This kind of post test probably won't be the usual paper and pencil kind. Sometimes just asking a simple question is sufficient to determine whether or not someone can already do a particular thing.)
5. PRE TEST—"Pre" in this case means prerequisites. Does the learner possess the necessary prerequisite skills to perform this task? If the answer is "no," we must make provisions for teaching these skills first.
6. TEACH—Incredible! We have done all these other things and have yet to teach. Yet, all the above steps are important and much of what was learned in going through those steps must now be incorporated into the teaching act.

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7. POST TEST—(Again!) Obviously, this is the "proof of the pudding" step. After all, isn't this why we went to all this trouble in the first place?

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*The comments following the bold-faced headings are the author's fuzzy recollections of Dr. Gordon's original explanations.

These kinds of lessons were important in helping me to realize that the design of instruction should encompass a thorough and precise methodology, linked with a technology that involves people and devices, a technological approach to curriculum development. McNeil (1977) commented that:

> Technology at first glance appears to be concerned with *how* to teach rather than *what* to teach. Technologists themselves view their curricular function as finding efficient and effective means to predetermined ends. A second glance shows that technology—the means produced—has a lot to do with the kind of matter that is or is not learned. (p. 35)

Therefore, the general goal of this chapter is for you to become aware of a technologist's philosophy and of some of the techniques used by him in teaching a graduate level course in instructional design. A strategy for teaching a course designed for in-service teachers, librarians, media specialists as well as for students from other disciplines such as allied health, dentistry, nursing, etc. will be described. Most of our students do not anticipate becoming full-fledged instructional developers. However, they do take the course hoping to improve their own instructional abilities. I stress that whether or not teachers plan to become instructional developers they are still responsible for doing the best possible job of designing their *own* instruction (Colton and Caton, 1974). Emphasis is given to an approach which stresses that for each step in the design process there is a corresponding product. The selected examples of in-class activities shown in this chapter are planned to help reinforce the process-product principle.

Every institution and every instructor is bound to follow a slightly different approach to the teaching of instructional design. Therefore, what is included here is in no way meant to describe strategies which would be entirely appropriate in all other situations. However, it is hoped that you will spot some usable segments in my approach and be able to adapt them to your own strategy for teaching design.

THE CONTEXT OF DESIGN COURSES

In an effort to place this chapter in context, I thought it important to investigate the courses in instructional development-design being taught in representative colleges and universities. For this purpose,

I surveyed the individuals who made presentations for the Division of Instructional Development at the 1977 convention of the Association for Educational Communications and Technology. Those being surveyed were asked to:

1. List any courses being taught at their institution which were planned primarily to give students the skills required in order to systematically design instruction. (See Table 1)
2. State the year in which the course or courses were first taught at their institution and, if a course was not a new one, to give the old course title if it had changed. (See Table 2)
3. State the percentage of course time devoted to the following categories of activities. (See Table 3)
   (a) Time and activities devoted to *rudimentary elements* of designing instruction (i.e., specification of objectives, task descriptions, task analysis, etc.)
   (b) Time and activities devoted to decisions about media *selection* (i.e., whether films, filmstrips, slides, transparencies, etc., are appropriate).
   (c) Time and activities devoted to the *design and preparation* of media choices (i.e., the planning and production of media choices).

TABLE 1. GENERAL INFORMATION

Number of surveys sent	35
Number of returns	19 (54%)
Number of institutions indicating course(s) taught in instructional development-design.	14*
Number of courses being taught	29

*Two institutions responding were service organizations which did not teach courses.

TABLE 2. NAME OF COURSE AND YEAR INITIATED

Design of Learning Environments	1970
Task Analysis	1970
Learner Analysis	1970
Introduction to Instructional Development (Audio Visual Communication Formal Education)	1976
Instructional Product Development (Programmed Instruction)	1968
Introduction to College Teaching	1975

Competency-based Instruction	1974
Introduction to Educational Technology	1973
Instructional Systems	1974
Design of Modular Instruction	1975
Instructional Design	1970
Programmed Instruction	1967
Instructional Design	1972
Instructional Technology	1972
Instructional Development, I	1976
Instructional Development, II (Evaluation)	1976
Design and Production of Educational Media	1976
Instructional Design and Development	1975
Instructional Development in Higher Education	1975
Principles of Instructional Development	1973
Seminar in Instructional Development	1971
Programming for Self Instruction	1970
Foundations of Educational Technology	1968
Design and Development of Instruction	1968
Competency-based Instruction	1973
Instructional Design and Development	1975
Instructional Materials Production	1975
Educational Media and Technology	1975
Curriculum Theory and Dynamics	1974

TABLE 3. ALLOCATION OF COURSE TIME BY CATEGORIES

Category A – Basic design decisions	67%
Category B – Media selection	11%
Category C – Design and preparation of media	19%

(Not all institutions reported 100% time in the three categories provided.)

Certainly, only limited conclusions can be drawn from the data inasmuch as only a small sample was utilized. However, the sample is representative of people who are obviously concerned with course offerings in the specialized area of instructional design. The data indicate that courses in instructional design are very new courses, the oldest listed being only ten years old (Table 2.) Table 2 also shows the diversity of titles given these courses. Most of the courses are graduate as opposed to undergraduate offerings.

From Table 3 we see that by far the greatest amount of time (67%) is devoted to what we might call basic design decisions which include

those items in descriptive category A. Lesser amounts of time are devoted to the other categories, B and C, which relate to media selection and production. It seems fair to assume that most people responsible for designing these courses believe that attention needs to be given to the basic design decisions in courses of this nature, and that other related areas, such as media selection and production, might be addressed in a contextual sense within the same course or possibly left to be explored separately in other courses.

BACKGROUND AND STRUCTURE OF THE DESIGN COURSE

When I first came to the University of Kentucky, we offered a course titled Programmed Instruction. For a couple of years I taught the course. It was a fascinating adventure — I taught students (and myself) how to write nice linear programs, perhaps less dull branching programs, and generally ended up with a bunch of students who probably wrote programmed instruction for the only time in their lives. When I was finally able to settle down and give it some thought, I succeeded in getting the course title changed to Basic Instructional Design. Now, at least, we end up with some students who, even though they don't usually become instructional developers, become better teachers, because they have given some attention to the meaning of what has been called "the moment by moment events of instruction" (Gagne and Briggs, 1974).

STRUCTURE

One thing I've always liked about teaching courses in instructional technology is that since we espouse the stating of objectives, etc., it certainly behooves us to do the same in our own classes. In other words, we surely would not want to be placed in the embarrassing position of having to say to our students, "now don't do as I'm doing, but do as I am saying!"

Therefore, students know from the first day of class what is expected of them. The syllabus shows them that they are going to be studying a process called instructional design which, when pursued with dedication and thoroughness, can yield a highly desirable product — well designed instruction. Ninety per cent of their grade, in one way or another, is linked to this process-product cycle. The other 10% also has an indirect connection in that each student abstracts three research studies which relate to instructional design.

More than anything else the feeling I try to convey in the class is one of openness. No hidden agendas. No pop-quizzes. None of this business of the students trying to "psych-out" the instructor to find out what is expected. It is all "up front." By getting as much out in the

open as we can in the beginning of the course, it removes a lot of tension. I also try to capitalize on the varied experiences of the class members. This helps develop the principle that good instructional design techniques can be applied to any discipline. It should be obvious at this point that the grades are not determined by the curve – that students are given the written standards which they then try to achieve.

REALITY ASPECTS OF PLANNING AND TEACHING A DESIGN COURSE

Davis, Alexander and Yelon (1974) in their text, *Learning System Design*, stress the importance of the identification of a referent situation for objectives. A referent situation is a situation outside of a course (for example, in one's job, hobby, or in another course) where it is important to achieve the particular objective being taught. The notion of the referent situation has been crucial in the planning of our instructional design course. I have constantly tried to avoid having students work with contrived examples which have no relationship to their interests or responsibilities. Rather, I have encouraged students to work with topics which are currently relevant to them.

As a general approach, I have tried to stress those things which teachers normally have a hard time accomplishing. For example, the teacher is usually given a list of broadly stated goals for which her students are to be responsible. The conversion of these broadly stated goals into explicit and measurable instructional objectives is a teacher-needed skill which is often lacking. Likewise, the development of appropriate evaluation devices which parallel instructional objectives is a dimension with which most teachers have difficulty.

My experience has been that I am better off trying to emphasize some of these simpler components, at least in the early stages of the course, than attempting to become highly sophisticated too soon. I spend time at the beginning of the course making sure that students comprehend some of the basic reasons for the use of instructional objectives. The additions to the literature of books like *Using Instructional Objectives in Teaching* (Clark, 1972) and *Objectives in Curriculum Design* (Davies, 1976) have helped to make this task easier.

Another characteristic of our procedure, one which is sometimes a bit unusual in graduate courses, is that I try to actively involve the students by offering as many opportunities as possible to practice the design process. I currently use the textbook *Learning Systems Design* (Davis, Alexander and Yelon, 1974) and the accompanying workbook and slidetape series. However, I am finding that practice activities which emphasize the students' own referent situations rather than those depicted in the commercially prepared materials are more appropriate to

their needs. I have designed activities for large groups, small groups, pairs of students and individuals. Students seem to enjoy working with their colleagues more than being interfaced with a workbook. When students understand that they are not competing with their fellow students for grades, they like the reinforcement and support gained from working with their peers.

SELECTED CLASS ACTIVITIES

The activities described in this section are included because they are representative of a variety of configurations for learning and because they were designed to meet particular problems.

PRE-ASSESSMENT ACTIVITY

On the first day of the course students are given an opportunity to express in writing their notions about how instruction should be designed. I have discovered that much of what teachers have done in the past in conjunction with making lesson plans, course outlines, syllabi and other plans can be very useful if allowed to surface. The point is that it is important for students to discover that they have been doing a lot of things that were perfectly appropriate and with this knowledge the design process seems a little less awesome to them.

SITUATIONAL-STATES ACTIVITY

Another activity somewhat closely related to the one on preassessment is one we call a situational-states activity and is based on the "what is, what ought to be" idea. The activity is shown in Figure 2. Almost all of the students in our course have had some professional experience.

Figure 2 shows situational "states" of teachers, librarians-media specialists and administrators as these positions relate to instructional development. Students are asked to choose the job category of most interest to them and respond to the statements.

Instructions: Read across the page and place a check ( ) before the statement which is more appropriate to you.

STATE "A"		STATE "B"
It *might* be that you . . .		It *could* be that you . . .
1. ___ feel you should redesign your instruction but you didn't know how.	OR	___ have sought out instructional development courses, workshops, or references.

2. ___ prepare lesson plans but they are mainly for your own use.	OR ___	have written objectives and activities of which students have copies.
3. ___ use media occasionally but mainly because "it's the thing to do."	OR ___	select media on the basis of how it fits your learners' needs and competencies.
4. ___ spend a lot of time explaining to the group what is expected of them.	OR ___	spend a lot of time helping individual students pursue specialized interests.
5. ___ find making decisions about grades a traumatic experience.	OR ___	are constantly inventing ways for students to mark their own progress.
6. ___ often wonder why kids seem so bored in school.	OR ___	find yourself working even harder but not minding because kids are involved.
7. ___ dread having your administrator pay an in-class visit.	OR ___	proudly share the details of your learning system design.
8. ___ find it difficult to talk with parents about their children's work.	OR ___	feel much more comfortable talking with parents because you have specific goals for their children.
9. ___ find yourself without counsel regarding instructional development.	OR ___	have the cooperation of librarians, media specialists, supervisors and administrators in your development effort.
10. ___ feel it is someone else's job to develop curricula.	OR ___	even consult with *kids* on what they would like to learn.

Figure 2. Situational states of teachers as these positions relate to instructional development.

Figure 2 (Cont'd) – Librarians – Media Specialists

STATE "A"		STATE "B"
It *might* be that you . . .		It *could* be that you . . .
1. __feel instructional development is outside your domain.	OR __	expect to be involved in instructional development
2.__ are limited in staff and other duties take precedence over instructional development.	OR __	have or are seeking staff and financial support for instructional development
3. __ seldom discuss developmental projects with faculty or administrators.	OR __	are prepared to suggest resources and alternative strategies for development efforts.
4. __ are hesitant to discuss techniques for improving teaching.	OR __	suggest linkages between teaching strategies and media utilization.
5 __ feel it a bother to confer with faculty regarding media or materials purchases.	OR __	believe that knowledge of teachers' goals for their students is a key factor toward building a sound collection.
6. __ wonder why only a few faculty utilize your supportive services.	OR __	are constantly searching for ways to assist all faculty and students through supportive services.

Figure 2 (Cont'd) – Administrators

STATE "A"		STATE "B"
It *might* be that . . .		It *could* be that . . .
1. __ your school provides teachers "broad goal" curriculum statements.	OR __	"broad goal" curriculum statements are broken down into specific learning objectives.
2. __ your school provides no professional assistance in helping teachers plan instruction.	OR __	your school holds regular in-service sessions devoted to curriculum development.
3. __ your school provides a planning period for most teachers.	OR __	your school provides special reward incentives for teachers engaged in instructional development.
4. __ your school expects teachers to develop "innovative curricula."	OR __	your school system has identified areas of curriculum need through systematic study.
5. __ your school expects teachers and students to use "audiovisuals."	OR __	your school expects teachers, librarians and media specialists to help prescribe the most appropriate choices of print and non-print media matched to learning objectives.

In fact, the average number of years of teaching experience is over four years. After students have located the most appropriate category (teachers, librarians or media specialists, or administrators), they mark their sheets according to their experience with the various statements. In sharing the responses with the total class, I have found that the majority of students end up in "State A" while agreeing that being in "State B" would certainly be more desirable. Admittedly, this activity is not nearly as meaningful with the graduate students who lack teaching experience. I have found that students are more apt to become committed to a class when they feel that what they are going to learn will help them with some of their everyday problems. This kind of activity shows them some potential ways of changing and solving some problems.

INSTRUCTIONAL OBJECTIVES CONCERNS ACTIVITY

I mentioned earlier that a book by Cecil Clark, *Using Instructional Objectives in Teaching,* has been helpful in providing a background for discussing some areas of concern related to the use of instructional objectives. As an activity for which students can prepare outside of class I ask them to investigate the list of concerns shown in Figure 3.

Figure 3. Some areas of concern related to the use of instructional objectives.[1]

For discussion . . .

1. **How shall we define an objective?**
2. **How do objectives differ from each other?**
3. **How are objectives related to each other?**
4. **How are objectives generated from an entire unit?**
5. **Why have instructional objectives?**
6. **How does the use of instructional objectives differ from what teachers have been doing all along?**
7. **How useful are general educational objectives (goals)?**
8. **Have I generated measurable objectives?**
9. **How appropriate are my objectives?**
10. **How important is it to sequence objectives in a given order?**
11. **How are objectives used in planning instruction?**
12. **How can I tell when my objectives have been attained?**
13. **What effects do instructional objectives have on individual differences?**
14. **Who should be responsible for developing objectives and what sources are available?**
15. **How usable is a taxonomy of educational objectives?**
16. **What does research say about the use of instructional objectives?**

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[1]Clark, Cecil D. *Using Instructional Objectives in Teaching.* Scott, Foresman and Company, 1972. (Quoted with permission of publisher.)

The "pros" and "cons" presented by Clark always stimulate lively discussions and these discussions seem to allay some of the fears inherent in some students with regard to instructional objectives. Since instructional objectives are central to the rest of the design process I teach, I feel it is essential that any concerns be openly explored.

ACTIVITIES IN DEVELOPING SKILLS IN WRITING OBJECTIVES

Amazingly, some students have never been required to prepare instructional objectives; therefore, I provide them with a model, the "A, B, C, D Model," which is shown in Figure 4.

Figure 4. A, B, C, D Model

When constructing an objective, consider the following factors . . .

The Audience	Names who, in what situation, with what prerequisite skills.
The Behavior	Describes the action word. Write, say, point to, draw, act out, etc.
The Conditions	Describe: 1. What will the learner respond to (pictures, real objects, etc.) 2. What directions will be given to the student and how will they be given (written, said, etc.) 3. What things will the learner have at his disposal? a. to use as a reference b. to manipulate
The Degree	1. How long does he have to complete the task? 2. What are the criteria against which a response is judged either correct or incorrect? 3. What is the degree of accuracy desired? 4. A fourth question could be asked here: How long should the learner retain the capability? For this course we shall not be too concerned with trying to determine just how long a skill should be retained although in most cases we would assume retention would be at least until the completion of the course.

The built-in mnemonic helps students to remember the essential elements of an objective. However, knowing the components of the model and being able to put together an intelligible instructional objective seem to be two entirely different skills. To assist students who have trouble putting the elements together, I have developed a module for that purpose, a part of which is shown in Figure 5. (See next page)

It has been my experience that students become frustrated when trying to write instructional objectives by themselves. They need someone around to react to what they have written. Therefore, we use the "A, B, C, D Model" and the module just mentioned as in-class activities so that students don't get bogged down in this crucial stage of the process. Another reason we are so concerned about students being able to write sound instructional objectives is that they must design units or modules for their class projects, and again, the formulation of proper instructional objectives is a "must" if their projects are to be successful.

Another skill closely associated with writing good instructional objectives is that of being able to construct appropriate evaluation devices which parallel each objective. This provides an excellent opportunity for pairs of students to work together. One of the partners writes an

Figure 5. Excerpt from module on writing instructional objectives.

Sometimes it is difficult to know how to actually begin writing an objective even though you have in mind a good action verb. Here are some alternatives for getting started:

"Having read the textbook chapter on . . ."
"The student in sixth-grade chorus . . ."
"After having participated in the class discussion . . ."
"The learner will . . ."

After having examined these several examples it appears that objectives usually start with identification of some *conditions* or by naming for whom the objective is intended (the *audience*).

To illustrate formulating an objective, look at this example:
First, think of an action verb and the subject-matter topic:

construct (will construct) — (action verb)
right triangle — (subject-matter topic)

Then think about how you want to start the objective, remembering objectives usually start with a statement of the conditions or the audience . . .

The seventh grade math student with the aid of a protractor
(the audience) (conditions)

and add the degree . . .

accurately
(degree)

USE THE REST OF THIS PAGE AS A WORKSHEET AND TRY CONSTRUCTING AN OBJECTIVE ACCORDING TO THE FOLLOWING SCHEME:

Think of your action verb and the subject matter and write them:

_____ (action verb) _____ (subject-matter topic)

Now, think of how you want to start the objective:

_____
(name the audience)

OR

_____
(mention some conditions)

Now write the degree part of your objective:

_____
(degree – how well / how quickly?)

(cont'd)

SEE IF YOU CAN COMBINE ALL FOUR PARTS

(first try) _____

_____

_____

How does it look? A little rough, perhaps? If so, have another crack at it by revising your objectives on the lines below.

Objective No. 1

(second try) _____

_____

_____

AT THIS POINT IT IS IMPORTANT FOR YOU TO HAVE SOME FEEDBACK FROM YOUR INSTRUCTOR. IF YOU HAVE BEEN SUCCESSFUL, TRY WRITING ANOTHER OBJECTIVE USING THE SAME METHOD. FIRST, THINK OF AN ACTION VERB AND SUBJECT TOPIC.

Next, begin writing the objective by naming either your audience or stating some conditions. Now add the degree part to the behavior and combine the whole thing.

Objective No. 2 _____

_____

_____

OF COURSE A VERY GOOD WAY OF TESTING YOUR OWN OBJECTIVE FOR COMPLETENESS IS SIMPLY TO GO BACK TO THE A, B, C, D MODEL AND CHECK TO SEE THAT YOU HAVE INCLUDED ALL THE RELEVANT PARTS.

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instructional objective and gives it to the other partner. That person, without any prompting, must then write the actual evaluation device (or description of same) which would be used with the objective. If the person writing the evaluation part has difficulty or else writes an evaluation device which is unacceptable to the author of the objective, then there is obviously a problem which must be solved. The partners then reverse roles. The activity stresses the necessity of writing unambiguous objectives which clearly indicate the appropriate evaluation measure required.

INITIAL PLANS FOR CLASS PROJECT ACTIVITY

By the third week of this semester-long course, I want to have assurance that all students are making a good start on their class projects. I have seen too many students who have procrastinated on projects of this kind; they approach the end of the semester and have to throw together a crash effort to complete their work. Additionally, the course is designed for students to progress with their own projects at about the same pace as the course progresses through the study of the design process. Therefore, students are asked to complete the form shown in Figure 6. Answers to question number four (What, if any, problems do you have at this point regarding the designing of the unit? How may I be of assistance?) have been most revealing and I believe in some cases have "saved" students from becoming discouraged and dropping the course.

Figure 6. Initial Plans for Class Project

Name _____

Please react to the following questions:

1. What is the approximate goal of your project to be? (Not the specific learning objective(s)). Example: to develop a unit, lesson, module, etc., for instruction of students in the use of linear equations.
2. Have you prepared learning objectives for the unit? ___ Yes ___ No.
   If "no," by when do you intend to do so? (date) _____
   Have you prepared test items to support these objectives? ___ Yes ___ No.
   (Disregard if you answered "No," to No. 2.)
3. If you have progressed to this point, *list in short phrases* what additional steps you have taken in designing your unit. (Again, disregard if inappropriate.)
4. What, if any, problems do you have at this point regarding the design of the unit? How may I be of assistance? (Use the back if necessary.)

ACTIVITIES FOR CATEGORIZING OBJECTIVES

One of the most difficult set of skills for students to acquire is that of identifying learning tasks by their intellectual categories. It is necessary that students be able to categorize learning tasks as response chains, discriminations, concepts, rules (or principles) or problem solving. (Gagne and Briggs, 1974). This ability to classify objectives into broad categories allows one to then consider certain conditions, both internal and external to the learners, which are associated with each category. These conditions provide precise clues for the planning of instruction.

As a starting point in helping students to acquire the categorizing skill, we discuss the definitions of the different categories. In addition to the Gagne and Briggs (1974) reference and Davis, Alexander, and Yelon (1974), a chapter by Herbert J. Klausmeier titled "Instructional Design and the Teaching of Concepts" (in Levin and Allen, 1976) is especially helpful in clarifying the concept category. Then we gave students lists of tasks similar to the one shown in Figure 7, to categorize and discuss in class.

Figure 7. Task Classification

The following are incomplete statements of objectives. In order to conserve space and time, only the conditions and the action word have been included. Mark the first letter(s) of the appropriate categories beside each task: response chain, discrimination, concept, rule, problem solving.

1. **When the teacher shows the learner a picture of an object, the learner will say the name of the object represented by the picture.**
2. **When the teacher says the German word, the student will say the English equivalent.**
3. **When given a collection of objects, some of which are oranges and some of which are not, the learner will place all of those objects which are oranges into one pile and all of those which are not oranges into another pile.**
4. **When given an array of objects, some of which are rolling and some of which are not rolling, the learner will point to those objects which are rolling.**
5. **When given the statement of a problem, the learner will write the correct answer to the problem.**
6. **When the teacher says the chemical name, the learner will write the chemical symbol.**
7. **When the teacher gives the learner a bunch of living animals, some of which are frogs and some of which are not frogs, the learner will point to all those animals which are frogs and state why he says that they are frogs.**
8. **Given a problem in which Boyle's law is used, the learner will write the correct solution to that problem.**

They are then asked to generate objectives from their own subject matter areas in each of the categories.

Next, we try to emphasize the importance of the fact that once one has been able to categorize an objective, it is important to apply appropriate information related to that category to the design of the instructional sequence. For example, if a task is one requiring the identification of a concept we try to get the students to think about a series of moves which this implies would be built into their design. Figure 8 shows some moves associated with the teaching of a concept.

Figure 8. Moves Associated with Teaching Concepts

1. Prerequisites previously established by discrimination.
2. Start with positive example.
3. Use both examples and non-examples. (Also good to have student generate his own.)
4. Emphasize criterial attributes for search routine.
5. Use examples other than those given in lesson.
6. Usually have student give a definition of the term.
7. Confirm quickly.
8. Mention name just prior to introducing another instance.
9. Continuity of presentation of instances and responses.
10. Have student verbalize search routine.
11. Verbalize cues to help student recall and restate.
12. Present instances to which student can generalize.
13. Start with clearest examples and work to the more difficult.
14. Use instructions to stimulate recall.
15. Tell why it isn't an example – not just that it isn't.
16. Encourage and guide discovery.

GROUP ACTIVITY TO PRACTICE TEACHING CONCEPTS

Because concepts are probably the most common type of task taught in schools, we spend a lot of time concentrating on them. An activity which students seem to enjoy and also derive much benefit from is one in which the class (usually about 20 in number) is divided into groups of 4 or 5 students each. Each group is given a concept and the members are told they must demonstrate to the rest of the class how it would be taught. The group may either choose to teach the concept to the rest of the class or may role play within the group to show how it would be taught. The peer criticism is keen but the groups are also appreciative of well-thought-out instructional sequences.

OTHER STRATEGIES FOR LEARNING INSTRUCTIONAL DESIGN: PUBLISHED RESOURCES

Many in-service teachers are now being called upon to exercise instructional design skills when they have neither had the opportunity to acquire these skills nor are in a position to obtain them. These teachers face a real dilemma. They know they should be involved in systematic approaches to planning because everything they read alludes to that notion, but they seldom receive the kind of training or have the experience required to become proficient. Many teachers have, therefore, had to attempt to train themselves through searching the literature and trying their newly discovered techniques in practice.

In exploring the literature on instructional design, it appears that at one time programmed instruction was the model used to show people the process of breaking down tasks into their component parts, arranging sequences, providing cues and prompts and deciding upon appropriate evaluation indices. This was at a time when other strategies for designing instruction had either not been published or were not yet popular. As other strategies emerged, people began to realize that programmed instruction was only one of the many formats which could be used to help students to achieve their objectives.

In the middle 1960's, more works began to appear which expanded the concepts of instructional design beyond those of programmed instruction. With the publishing of Robert Mager's *Preparing Instructional Objectives* and Robert Gagne's *The Conditions of Learning,* the simple notion of "where am I going, how do I get there, and how do I know when I have arrived?" began to have real significance. College and university professors attempting to teach students instructional design often relied on more traditional psychology or learning theory texts (if they used one at all) to provide the theoretical basis for their newly found discipline.

Soon a glut of books about instructional design began to appear. However, many of these books were so general in nature that they were not very helpful to students needing to acquire precise skills to design instruction. While these books contributed in a total way to a synthesizing of the instructional development picture, they for the most part did not reach the level of the aspiring instructional designer.

Finally, by the late 1960's, some significant and helpful works were published. A series of monographs from the American Institutes for Research, authored principally by Leslie Briggs, zeroed in on discrete instructional design functions. Gagne's second edition of the *Conditions of Learning* (1970), this time with an accompanying *Student Handbook,* continued to reflect the much needed blend of learning theory and common sense. Then in 1974, Gagne and Briggs combined their talents to write *Principles of Instructional Design,* which was based upon the three assumptions that: (1) instructional planning must be for the individual; (2) instructional design has phases that are both immediate and long-range; and (3) systematically designed instruction can greatly effect individual human development.

An important theory, stressed in another recent text and accompanying materials, is that often the designer and teacher are one-in-the-same. Davis, Alexander and Yelon (1974), of Michigan State University, have authored the text *Learning System Design.* With the assistance of Allan Abedor, they also produced a series of filmstrips and audio tapes, a student workbook, and a teacher's manual. Taken as a complete package,

these materials give the design student the opportunity to become an active participant in the practice of design procedures.

The extensive bibliography which appears at the conclusion of this chapter will hopefully alert students and teachers of instructional design to the many sources of information currently available. While the bibliography does not attempt to be inclusive, it does include many of the major works published since the middle 1960's, with a few noteworthy references prior to that time.

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